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versities are doing nothing for the promotion of agricultural science; and that at the time he came to Washington, and until the Bureau of Soils was established, nothing was known about soils—meaning, presumably, the soils of the United States.

In the light afforded by Bulletin No. 22 of the Bureau of Soils, which I have recently discussed in the columns of SCIENCE, the source of the Secretary's information is not far to seek. Having departed from all precedent in the matter of soil work, whether in the field or in the laboratory, in the old world or in the new, the Bureau of Soils simply declares all former soil work to be '*nul et non avenu*'—void and of no effect; and so informs the Secretary.

In view of the existing records, this seems an extreme liberty to take with the facts of the case. It is true that in some of the states, the public surveys and even some stations have taken the soil features but very little into account. But in many others, the soil features have been quite elaborately observed, elaborated and discussed. Beginning more than half a century ago, David Dale Owen conducted the work of the geological surveys of Kentucky and Arkansas; and we find in the reports of these surveys not only the chemical analyses of several hundred soils from these two states, but, accompanying them, descriptions of their physical and agricultural characters, as well as of their native vegetation. Following the lead of Owen, the present writer undertook similar work in connection with the geological and agricultural survey of Mississippi, and from 1857 to 1873 continued these studies from the physical, chemical and botanical standpoint. In 1880, being in charge of the report on cotton production of the Tenth Census of the United States, he undertook to compile detailed agricultural descriptions of the cotton-producing states (then including California), which were elaborated largely by the respective state geologists, and form parts of Vols. V. and VI. of the Census report of 1880. There are embraced within these volumes extended descriptions and maps of the several soil areas in these states, with 612 chemical and 12 physical

analyses of soils, fully discussed in their bearings on agriculture. In 1892, the Department of Agriculture published, as Bulletin No. 3 of the Weather Bureau, a paper prepared by myself 'On the Relations of Soils to Climate,' in which among other things there is given a discussion of 779 analyses of soils of the United States, and of the nature, occurrence and reclamation of alkali lands.

Since that time many other states have entered upon similar lines of work; among them especially Minnesota, Texas, South Carolina, North Dakota, Washington, Idaho, Wyoming, Michigan and Rhode Island, in some cases with very elaborate cultural data and discussion. The entire number of soil analyses made in the United States thus far is probably in excess of 1,500.

In the face of all these facts, of which the records are easily accessible, especially at Washington, the Secretary of Agriculture has evidently been informed that practically no soil work worthy of the name had been done in this country until the present Bureau of Soils was organized by him; and has thus been induced to think it a matter of first necessity to send over two hundred scientists (*sic*) into the various states to fill these glaring deficiencies. Evidently it *has* been possible for the Bureau of Soils to find within the United States so large a body of qualified soil experts. The phenomenal rapidity with which these observers map the soil areas laid down in the reports of the bureau, seems to show that this feat has been accomplished. How well the work so done will stand the test of criticism from the scientific and practical standpoint remains to be seen.

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UNIVERSITY OF CALIFORNIA,
January 8, 1904.

SPECIAL ARTICLES.

PRELIMINARY REPORT ON THE CLASSIFICATION OF
THE ROCKS OF THE WATKINS GLEN (30')
QUADRANGLE (U. S. GEOLOGICAL
SURVEY).*

DURING the summer of 1903 Henry S. Williams assisted by Edward M. Kindle made the

* By permission of the Director of the U. S. Geological Survey.

survey of the Watkins Glen quadrangle preparatory to forming the folio map of this region. The results of the field work are now sufficiently well elaborated to permit of the following announcement:

The general similarity of the rocks of this whole region has made the use of paleontology in classifying them a necessity, and the resulting classification is primarily based upon paleontological evidence.

The rocks of the region have a general southerly dip, and the formations exposed on the surface are all Devonian. The lowest formation mapped is the Genesee black shale outcropping in the extreme northern part of the quadrangle in the bottom of the valleys of Cayuga and Seneca Lakes. Two major formational divisional planes are traceable across the quadrangle from east to west. These planes separate the Genesee from the following Portage, and the Portage from the succeeding Chemung. The paleontology is the chief ground for drawing these lines, but the lithology is in harmony with the other evidence. The Portage formation lying between these two planes attains a thickness of from 1,250 to 1,300 feet. Below it the Genesee is 120 to 150 feet thick. Above the Portage 1,225 feet of Chemung has been traced, but the top of the range of the Chemung fauna was not reached in the area surveyed.

No other planes offered sufficient continuity of evidence, either lithological or paleontological, for drawing the lines across the whole quadrangle. In the eastern half of the quadrangle the Portage is divisible, on clear paleontological evidence, into three members: the lower Portage, approximately 250 feet; the Ithaca, 400 feet; and the upper Portage, 600 feet thick. Faunally the same species characterize the lower and upper members of the Portage. The central member (the Ithaca) holds an entirely distinct fauna, homeotopic with that of the Hamilton and Chemung faunas lying below and above it. The lithological characters of the Ithaca are in general distinct from those of the Portage, but the difference is due rather to the dominance of the argillaceous shales in the Ithaca, over the flags and thin-bedded fissile, and

generally dark-colored, shales which are more characteristic of the Portage, than to any uniform lithological character of either.

In the Seneca Lake valley the subdivision of the Portage into three members can not be made out sharply upon either lithologic or paleontologic evidence. A few scattered species of the Ithaca fauna appear within their proper zone, but the lower and upper Portage conditions dominate all through the sections for the whole 1,200 to 1,300 feet. The Portage fauna also recurs in some sections after the entrance of the Chemung fauna into the general region. The faunas of the Genesee and Portage are more closely related to each other biologically than either of them is to the Hamilton or to the Chemung fauna.

A recurrence of Hamilton species takes place in several zones; the more conspicuous cases are near the base of the Ithaca member, in Cascadilla Creek in Ithaca (as was stated in Bulletin 3 of the U. S. Geological Survey in 1884); near the base of the Chemung within the lowermost 100 feet of several sections in the quadrangle; and again in the upper Chemung about 600 feet above its base. This highest discovered *Tropidoleptus* zone is seen in quite a number of the sections in the southern half of the quadrangle.

In these recurrent faunas the more characteristic as well as dominant species are *Tropidoleptus carinatus*, *Rhipidomella vanuxemi*, *Cypricardella bellistriata*; also *Phacops rana* has been seen, and specimens of a *Spirifer* not to be distinguished from typical Hamilton forms of *Spirifer (mucronatus) pennatus*.

The lower zone of this fauna in the Chemung is below the first appearance of *Spirifer disjunctus*, but the upper zone is hundreds of feet above the first appearance of the typical *Spirifer disjunctus* fauna, and in several sections that fauna occurs abundantly both below and above it within a few feet of thickness of strata. The recurrent species are generally associated with a few of the common species of the normal fauna of the part of section in which they occur, but *Spirifer disjunctus* has not been discovered associated with them, though often occurring below as well as above, not very far distant.

These Hamilton recurrent zones rarely occupy over a couple of feet thickness. They are more conspicuous in the eastern than in the western parts of the quadrangle. In them the Hamilton species are often quite abundant, to the almost total exclusion of other species. Some slabs were obtained from actual outcrops on which nothing distinctively Chemung was apparent.

Near the top of the Chemung formation of the quadrangle, in the townships of the southern part of the Waverly quarter sheet are some distinct conglomerates with a fauna diverse from that of the Chemung which appears above as well as below them stratigraphically. The conglomerates are quite local, as shown by their non-appearance at the same altitude in some hills not far distant from those in which they were seen. In several parts of the quadrangle local limestone bands were seen, reaching a thickness of over a foot in some cases.

On the geological map of the state published by the State Geologist in 1894 a line is drawn between Hamilton and Portage, but as to which side of the Tully or Genesee no indication is given, and in the legend the Portage covers lower Chemung and Ithaca. In the revision of that map published in 1901 the outcrop of the Genesee is indicated, this is followed by the Portage in the western part of this region and over the quadrangle in part. In the eastern part the Ithaca rests upon the Genesee, thus making the Portage and Ithaca to occupy the same stratigraphic interval. Further east, in Chenango County and beyond, the lower half of this interval is indicated as Ithaca, and the upper half as Oneonta.

The upper line is drawn in the 1894 map between the Portage and Chemung; in the 1901 map between Portage and Chemung for the western half of the Watkins Glen quadrangle, and for the eastern half between the Ithaca and Chemung.

The result of the summer's work clears up both of these lines, showing the Ithaca to be a member of the Portage formation, as was first pointed out in Bulletin 3 of the U. S. Geological Survey in 1884, where also it was

then indicated that the Ithaca is not the lower part of the Chemung (as was claimed by Hall in 1843) but is separated from its base by an upper part of the Portage, of several hundred, now shown to be approximately 600, feet of strata.

H. S. W.

CURRENT NOTES ON METEOROLOGY.

METEOROLOGICAL SOCIETY OF JAPAN.

NUMBERS 5 to 8 of the *Journal of the Meteorological Society of Japan*, recently received, show encouraging signs of the continued activity of that scientific body. The society was founded in 1882, and numbers now more than 260 members. The language used in the *Journal* (now in its twenty-second year) has hitherto been exclusively Japanese, but in the future it is intended to insert articles on Japanese meteorology, as well as on other scientific matters, in English, French and German. The *Journal* is published by the editorial committee of the society, with headquarters in the Central Meteorological Observatory in Tokio. The title pages of the separate issues of the *Journal* are printed in English, and the list of papers shows a considerable range of interesting topics, e. g., 'Cloud Cap on Mt. Fuji,' 'On the Stationary Low Pressure Area in Formosa,' 'Storms in the North Pacific Ocean in April, 1903,' etc.

PROTECTION OF PEACH TREES FROM FROST.

IN Bulletin 80 of the Agricultural Experiment Station of the Agricultural College of Colorado (1903) a description is given of the new method of protecting peach trees from frost by 'laying down.' This was first tried in the fall of 1896, at Cañon City, and has proved very successful. Early in November (at Cañon City) the trees are put into winter quarters. The earth is removed from a circle about four feet in diameter around the tree, and water is turned on. When the ground is saturated, the trees are worked back and forth, and are finally pushed over, with comparatively little injury to the roots. Then the limbs are brought together by a cord, and burlap, covered with earth, is put over them. In the spring, the covering is gradually